



B.E/B.TECH DEGREE EXAMINATIONS: NOV / DEC 2024

(Regulation 2024)

First Semester

AERONAUTICAL ENGINEERING

24EET105: Basics of Electrical and Electronics Engineering

COURSE OUTCOMES

- CO1:** Analyze the fundamentals principles of DC and AC circuits
CO2: Apply various protective devices and Energy storage systems for various applications with a focus on energy efficiency and safety
CO3: Analyse the construction and working of DC motor, transformer, and induction motors and choose the motor for aircraft applications.
CO4: Illustrate the working of semiconductor devices and understand their applications in aircraft systems.
CO5: Apply the fundamentals of Boolean logic to design digital logic circuits.

Time : Three Hours

Maximum Marks: 100

PART A (4*20 = 80 Marks)

Answer all the Questions

1. **Scenario:** An aircraft's electrical system uses DC circuits for essential lighting and AC circuits for power distribution. Improper distribution causes malfunctions in power transmission.
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|---------------------------------------------------------------------------------------|---|-----|-------------------|
| a) State Kirchhoff's Current Law (KCL). | 2 | CO1 | [K ₁] |
| b) Define power factor and its importance in AC circuits. | 2 | CO1 | [K ₂] |
| c) Analyze the given (CKT) DC circuit in the aircraft system using KCL and Ohm's Law. | 6 | CO1 | [K ₄] |
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|---------------------------------------------------------------------------------------------------------------------|---|-----|-------------------|
| d) Evaluate the effects of low power factor on AC circuits in aircraft systems. | 6 | CO1 | [K ₄] |
| e) Suggest two techniques to improve power factor in AC circuits and explain their application in aircraft systems. | 4 | CO1 | [K ₄] |
2. a) List the advantages of using alternators in aircraft systems. 2 CO3 [K₁]
 b) Write the principle of operation of a single-phase transformer. 2 CO3 [K₁]
 c) Analyze the efficiency of a DC motor under varying load conditions. 6 CO3 [K₄]
 d) Examine the role of induction motors in high-power applications. 6 CO3 [K₄]
 e) Conclude the selection of specific electrical machines for different aircraft functions. 4 CO3 [K₄]

3. a) Describe the working principle of a Zener diode. 2 CO4 [K₂]
 b) Compare the characteristics of MOSFET and BJT. 2 CO4 [K₂]
 c) Design and analyze a full-wave rectifier circuit for aircraft power systems. 12 CO4 [K₄]
 d) Explain the application of operational amplifiers in sensor systems of aircraft. 4 CO4 [K₃]
4. a) State De Morgan's laws and their significance in digital logic design. 2 CO5 [K₁]
 b) List the function of a demultiplexer. 2 CO5 [K₂]
 c) Apply Boolean algebra to design a combinational circuit for controlling aircraft warning systems. 12 CO5 [K₄]
 d) Discuss about the application of flip-flops in aircraft communication systems. 4 CO5 [K₃]

PART B (1 x 20 = 20 Marks)
Answer any ONE Question

5. a) Define State capacitance and its role in DC circuits. 2 CO1 [K₁]
 b) How the energy is stored in a capacitor and provide its formula? 3 CO1 [K₂]
 c) Analyze the efficiency of protective devices (MCB, ELCB) in an aircraft electrical system. 5 CO2 [K₃]
 d) Describe the different earthing techniques. 5 CO2 [K₃]
 e) Design a digital circuit for monitoring multiple input signals in an aircraft control system using logic gates. 5 CO5 [K₄]

OR

6. a) State the Ohm's Law with an example. 2 CO1 [K₁]
 b) Discuss the importance of reactive power in AC circuits. 3 CO1 [K₃]
 c) Evaluate the role of aircraft storage batteries in power backup. 5 CO2 [K₄]
 d) Summarize the characteristics of lead-acid batteries used in aviation. 5 CO2 [K₃]
 e) Propose a simple counter design using flip-flops for tracking flight operations. 5 CO5 [K₅]

CO distribution summary:

	CO1	CO2	CO3	CO4	CO5
Marks (%)	25	10	20	20	25
